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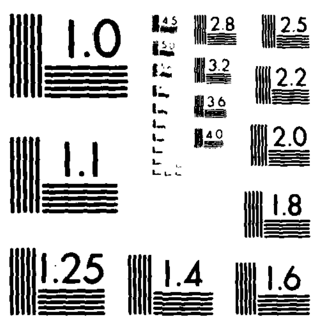

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MX SITING INVESTIGATION

GRAVITY SURVEY - BIG SAND SPRINGS VALLEY

NEVADA

Prepared for:

U.S. Department of the Air Force
Ballistic Missile Office (BMO)
Norton Air Force Base, Californi.. 409

Prepared by:

Fugro National, Inc.
3777 Long Beach Boulevard
Long Beach, California 90807

9 July 1980

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Results of a gravity survey of the Big Sandy Springs Valley of central Nevada show two steep dipping faults forming a deep graben [illegible] east of [illegible] Hills. The graben appears to end near Portuguese Mountain. The eastern range-bounding fault north of Portuguese Mountain shows progressively less gravity offset [illegible] northward. The [illegible] south end of the valley [illegible] young volcanic [illegible], but the gravity gives some [illegible]

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FOREWORD

Methodology and Characterization studies during fiscal years 1977 and 1978 included gravity surveys in ten valleys in Arizona (five), Nevada (two), New Mexico (two), and California (one). The gravity data were obtained for the purpose of estimating the gross structure and shape of the basins and the thickness of the valley fill. There was also the possibility of detecting shallow rock in areas between boring locations. Generalized interpretations from these surveys were included in Fugro National's Characterization Reports (FN-TR-26a through e).

During the FY 77 surveys, measurements were made to form an approximate one-mile grid over the study areas and contour maps showing interpreted depth to bedrock were made. In FY 79, the decision was made to concentrate on verifying and refining suitable area boundaries. This decision resulted in a reduction in the gravity program. Instead of obtaining gravity data on a grid, the reduced program consisted of obtaining gravity measurements along profiles across the valleys where Verification Studies were also performed.

The Defense Mapping Agency (DMA), St. Louis was requested to provide gravity data from their library to supplement the gravity profiles. For Big Smoky, Reveille and Railroad valleys, a sufficient density of library data is available to permit construction of interpreted contour maps instead of just two-dimensional cross sections.

In late summer of FY 79, supplementary funds became available to begin data reduction. At that time inner zone terrain corrections were begun on the library data and the profiles from Big Smoky Valley, Nevada, and Butler and La Posa valleys, Arizona. The profile data from Whirlwind, Hamlin, Snake East, White River, Garden and Coal valleys, Nevada became available from the field in early October, 1979.

A continuation of gravity interpretations has been incorporated into the FY 80 program and the results are being summarized in a series of valley reports. In reports covering Nevada-Utah gravity studies will be numbered, "FN-TR-33-", followed by the abbreviation for the subject valley. In addition, more detailed reports of the results of FY 77 surveys in Dry Lake and Ralston valleys, Nevada are being prepared. Verification studies are continuing in FY 80 and gravity studies are included in the program. DMA will continue to obtain the field measurements and it is planned to return to the grid pattern. The interpretation of the grid data will allow the production of contour maps which will be valuable in the deep basin structural analysis needed for computer modeling in the water resources program. The

gravity interpretations will also be useful in Nuclear Hardness and Survivability (NH&S) evaluations.

The basic decisions governing the gravity program are made by BMO following consultation with TRW Inc., Fugro National and the DMA. Conduct of the gravity studies is a joint effort between DMA and Fugro National. The field work, including planning, logistics, surveying, and meter operation is done by the Defense Mapping Agency Hydrographic/Topographic Center (DMAHTC), headquartered in Cheyenne, Wyoming. DMAHTC reduces the data to Simple Bouguer Anomaly (see Section A1.4, Appendix A1.0). The Defense Mapping Agency Aerospace Center (DMAAC), St. Louis, calculates outer zone terrain corrections.

Fugro National provides DMA with schedules showing the valleys with the highest priorities. Fugro National also recommended locations for the profiles in the FY 79 studies within the constraints that they should follow existing roads or trails. Any required inner zone terrain corrections are calculated by Fugro National prior to making geologic interpretations.

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1.0 INTRODUCTION

1.1 OBJECTIVE

Gravity measurements were made in Big Sand Springs Valley for the purpose of estimating the overall shape of the structural basin, the thickness of alluvial fill, and the location of concealed faults. The estimates will be useful in modeling the dynamic response of ground motion in the basin and in evaluating ground-water resources.

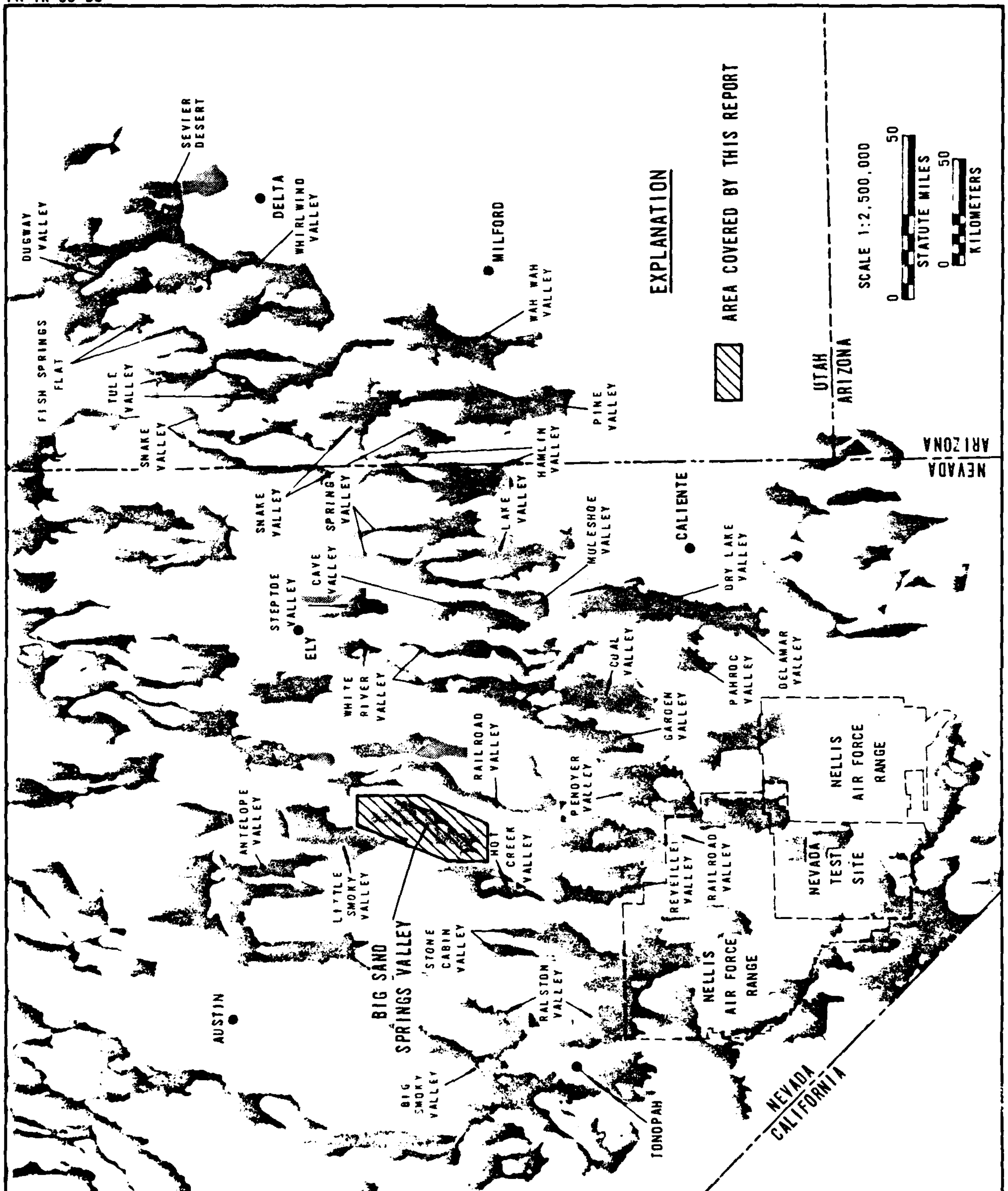
1.2 LOCATION

Big Sand Springs Valley is located in central Nevada (Figure 1) in Nye County. U.S. Route 6 crosses the southern end of the valley about 75 miles (121 km) east of Tonopah and 85 miles (137 km) southwest of Ely.

Big Sand Springs Valley is bounded (Figure 2) on the east and south by Pancake Range. On the west, it is bounded by Palisade Mesa, Halligan Mesa, Basalt Butte, Squaw Hills, Red Ring Mountain, and an unnamed ridge which separates it from Little Smoky Valley. Big Sand Springs Valley has a narrow opening, at the southwestern end, to Hot Creek Valley between Halligan Mesa and Basalt Butte. The valley has a similar narrow opening into Little Smoky Valley between Red Ring Mountain and the unnamed ridge at the northwestern end.

1.3 SCOPE OF WORK

Gravity data were supplied from the Defense Mapping Agency Aerospace Center (DMAAC)library and from new measurements made by



LOCATION MAP
BIG SAND SPRINGS VALLEY, NEVADA

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FIGURE 1

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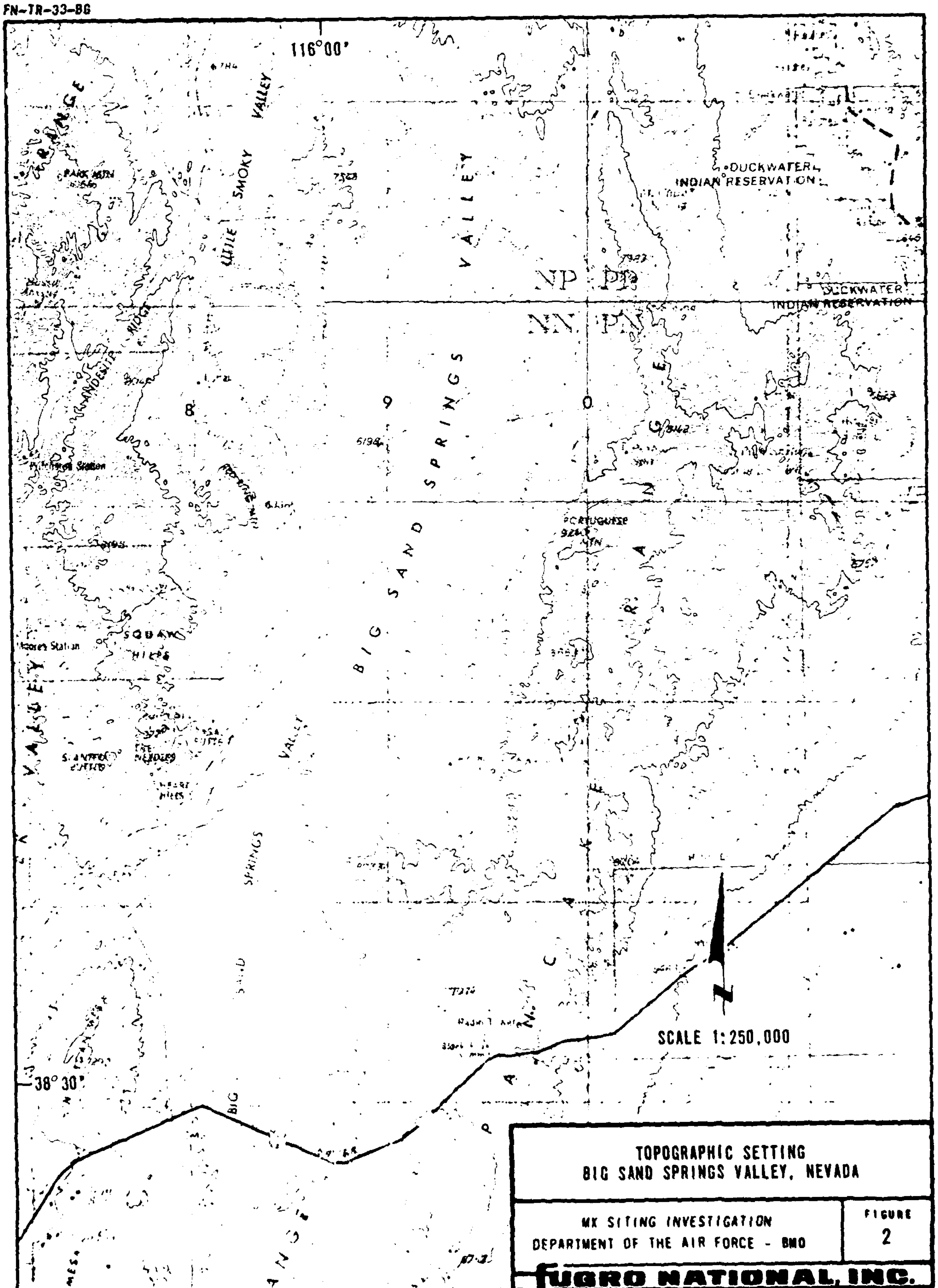

TOPOGRAPHIC SETTING
BIG SAND SPRINGS VALLEY, NEVADA

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FIGURE 2

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the Defense Mapping Agency Hydrographic - Topographic Center Geodetic Survey Squadron (DMAHTC/GSS).

Big Sand Springs Valley and Hot Creek Valley were studied together, but the results are presented in separate reports. The rectangular region containing both valleys is the area between latitudes 38°00' and 39°05', and between longitudes 115°45' and 116°30'. There are 3114 gravity stations in the region. Of these, the stations on bedrock were used to establish a common regional gravity trend for the two valleys. Big Sand Springs Valley lies within the rectangular area bounded by latitudes 38°21' and 39°01' and by longitudes 115°49' and 116°11'. The valley is about 35 miles (56 km) long and 9 miles (14 km) wide. There are 1200 gravity stations in this area.

2.0 GRAVITY DATA REDUCTION

DMAHTC/GSS obtained the basic observations for the new stations and reduced them to Simple Bouguer Anomalies (SBA) as described in Appendix A1.0. Up to three levels of terrain corrections were applied to the new stations to convert the SBA to the Complete Bouguer Anomaly (CBA). Only the first two levels of terrain corrections described below were applied to the library stations.

First, the Defense Mapping Agency Aerospace Center (DMAAC), St. Louis, used its library of digitized terrain data and a computer program to calculate corrections out to 104 miles (167 km) from each station. When the program could not calculate the terrain effects near a station, a ring template was used to estimate the effect of terrain within approximately 3000 feet (914 m) of the station. The third level of terrain corrections was applied to those stations where 10 feet (3 m) or more of relief was observed within 130 feet (40 m). In these cases, the elevation differences were measured in the field at a distance of 130 feet along six directions from the stations. These data were used to calculate the effect of the very near relief.

3.0 GEOLOGIC SUMMARY

Big Sand Springs Valley lies within the Basin and Range physiographic province in central Nevada. The valley trends northward and is bounded on the west by the Squaw Hills and an unnamed ridge, and on the east by the Pancake Range. The latter range exposes predominantly Late Tertiary and Quaternary volcanic rocks, especially at the southern and northern ends of the valley (Howard, 1978).

At the southern end of the valley, the topography is a result of many young volcanic craters, cinder cones and basalt flows (Rush and Everett, 1966), the youngest of which are believed to be Late Quaternary in age (Scott and Trask, 1971). Tertiary ash-flow tuffs, rhyolitic lava flows, and Paleozoic carbonate rocks underlie and surround these younger volcanic centers (Scott ant Trask, 1971).

The center of the Pancake Range comprises marine and continental sedimentary rocks of Paleozoic age. These rocks consist primarily of limestone, dolomite, and shale with some sandstone and quartzite. The Squaw Hills are composed primarily of Tertiary volcanic rocks with minor outcrops of Paleozoic carbonate rocks and Tertiary continental sedimentary rocks.

Big Sand Springs Valley is a shallow graben bounded by faults along both its eastern and western margins. An eastward dipping normal fault forms the western edge of the graben; to the east a westward dipping fault showing late Quaternary movement

bounds the northern half of the Pancake Range (Howard, 1978). This latter fault has uplifted the Pancake Range and exposes folded and faulted Paleozoic rocks.

The surficial basin-fill deposits are predominantly alluvial fan and lacustrine deposits. The lacustrine deposits are Pleistocene in age and are composed of silt and clay (Rush and Everett, 1966). Presently, a small playa exists at the same level as the earlier Pleistocene shallow lake. The older alluvial deposits, Quaternary and Late Tertiary in age, occur as fans over much of the valley floor. These are composed mainly of gravels and sands that are characteristically weakly indurated, poorly sorted and dissected (Rush and Everett, 1966). The younger alluvial deposits consist of reworked sand, silt, and clay from principal streams on the valley floor. These sediments are usually un-indurated, better sorted and generally more permeable than the older alluvial deposits (Rush and Everett, 1966).

A 6500-foot exploration drill hole in Hot Creek Valley, southeast of Morey Peak, penetrated 4000 feet (1219 m) of alluvium. Under the alluvium is 100 feet (30 m) of consolidated volcanic ash, then 200 feet (61 m) of lake beds - indicative of a basin and lakes in pre-Pleistocene time. Under the lake beds are Tertiary-age tuffaceous sediments and welded tuffs to a depth of at least 6500 feet (1981 m). Carbonate bedrock was not reached (Barnes and Hoover, 1968).

4.0 INTERPRETATION

The basis of interpretation is the Complete Bouguer Anomaly (CBA). The CBA is defined in Appendix A1.4.

The CBA data is reduced to a set of values at the points of a uniformly-spaced geographic array, or grid. This facilitates the mathematical treatment of irregularly-spaced data. Gravity stations are numerous along roads and areas where access is easy - they are fewer elsewhere. The gridding process is done using an algorithm which computes a value at each grid point from the gravity station data within a circular area around the grid point. A bell-shaped weighting function assigns greater weight to the nearer data points. The grid-point spacing is chosen to match the average data spacing. A 2-kilometer grid spacing was used for this analysis. Figure 3 shows the CBA contoured from gridded values.

4.1 REGIONAL-RESIDUAL SEPARATION

A fundamental step in gravity interpretation is isolation of the part of the CBA which represents the geologic feature of interest, in this case the valley fill. The valley fill has a lower density than the bedrock and therefore creates a negative gravity anomaly. The portion of the CBA which corresponds to this alluvial material is called the "residual anomaly".

The CBA contains long-wave-length components from deep and broad geologic structures extending far beyond the valley. These long-wave-length components, called the regional gravity, have

been approximated by a second-degree trend surface. The trend surface is a least-squares fit to the CBA values at the bedrock stations of the entire two-valley region. The regional trend is subtracted from the CBA to obtain the residual anomaly. The residual anomaly is used to calculate a simple geologic model which fits the gravity data and is consistent with geologic knowledge from other sources.

In this case, when the residual anomaly was compared with the geologic map, it was found to be positive at some grid points over alluvium near the basin margins. This effect was due to the use of the stations on volcanic rock (in addition to those on carbonate rock) to derive the regional trend. The regional trend was biased downward by the lower density of the volcanic rocks in comparison to the carbonate rocks. In areas of young volcanic flows, it may have been biased further by low density alluvium beneath the flows. Consequently, when the regional trend is subtracted from the CBA, the resultant residual anomaly is biased upward. This bias in the residual was eliminated by subtracting an amount which lowered the residual to zero near the basin boundary. That amount was 5 milligals.

4.2 DENSITY SELECTION

The construction of a geologic model from the residual anomaly requires selection of a value for the mean density contrast between basin fill and underlying rock. Fugro's previous reports on gravity surveys have drawn upon density information from shallow borings made in the Verification Studies. No such

borings have been made in Big Sand Springs Valley. However, there is more definitive density information for gravity purposes - a borehole gravimeter log to a depth of 6488 feet (1978 m) in northern Hot Creek Valley (Healey, 1967) 10 miles to the east.

The bulk density of the alluvium, calculated from the borehole gravimetry, increases from less than 2 gm/cm^3 near the surface to 2.34 gm/cm^3 at its base, 4200 feet (1280 m) deep. The weighted mean density of alluvium is 2.26 gm/cm^3. Below the alluvium is a relatively thin layer of lake beds, then 2000 + feet (610 + m) of weakly indurated volcanic rocks whose mean density is about the same as the deeper alluvium.

The borehole gravimetry supports our previously used choice of a density of 2.3 gm/cm^3 for basin-and-range basin fill - a choice based on shallow borehole information and extrapolation to depth.

The dense Paleozoic carbonate bedrock was assigned a density of 2.8 gm/cm^3, which is within the range of densities reported for carbonate rocks in the Basin and Range Province. The density contrast for modeling was therefore -0.5 gm/cm^3.

4.3 MODELING

Modeling was done with the aid of a computer program which calculates an iterative three-dimensional solution of gravity anomaly data (Cordell, 1970). The gravity anomaly is represented by discrete values on a two-dimensional grid. The source of

the anomaly (the volume of low-density valley fill) is represented by a set of vertical prism elements. The tops of the prisms lie in a common horizontal plane. The bottoms of the prisms collectively represent the bottom of the valley fill. Each prism has a cross-sectional area equal to one grid square, and a uniform density. A grid square of 2 km by 2 km was selected as representative of the gravity station distribution. Computation was continued for five iterations of mutual interactive prism adjustment. The root-mean-square error for the entire grid was less than 0.5 milligal.

The calculated thickness of the valley fill depends upon the density contrast (i.e., fill density minus rock density). Since neither density is perfectly known, nor even uniform, the calculated thickness should be expected to contain a corresponding degree of uncertainty. The calculated thickness of fill, or interpreted depth-to-rock, is contoured in Figure 4.

4.4 DISCUSSION OF RESULTS

The computed model of Big Sand Springs Valley, obtained from gravity data, indicates a deep narrow graben in the south-central part and a broad, shallow graben throughout the northern part of the valley (Figure 4). Maximum model depths range from greater than 7000 feet (2134 m) in the south to about 1000 feet (305 m) in the shallow north.

The deep part of the valley is interpreted as being the result of uneven subsidence, or downfaulting, of a pair of fault

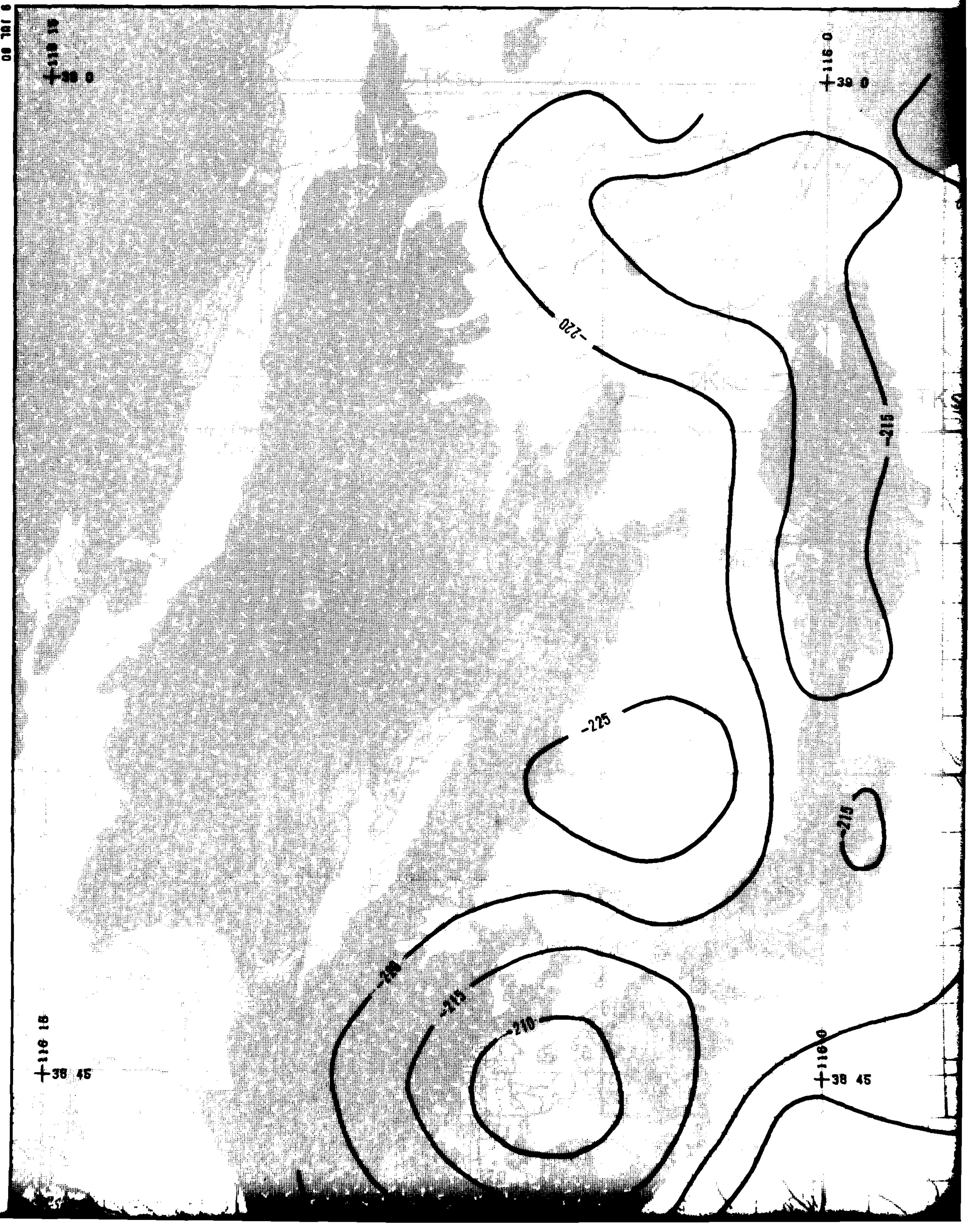
blocks. This interpretation is consistent with geologic information from aerial photographs, surface mapping, and regional geology.

The young volcanic rocks are found to have a density of 2.5 or less, however since the volume of this material is unknown, the effect on our model cannot be determined. The presence of surface basalts indicates fundamental crustal breaks along which it was extruded (Figure 5). Regional geologic relationships suggest that these Quaternary basalts overlie and are interbedded with Quaternary alluvium.

5.0 CONCLUSIONS

The gravity data for Big Sand Springs Valley shows steeply dipping faults forming a deep graben south and east of Squaw Hills. This graben appears to end near Portuguese Mountain. The eastern range-bounding fault, north of Portuguese Mountain, shows progressively less gravity effect as the valley shoals northward.

The extreme south end of the valley is partially obscured by young volcanic flows, but the gravity gives some indication of a deepening beneath the flows.



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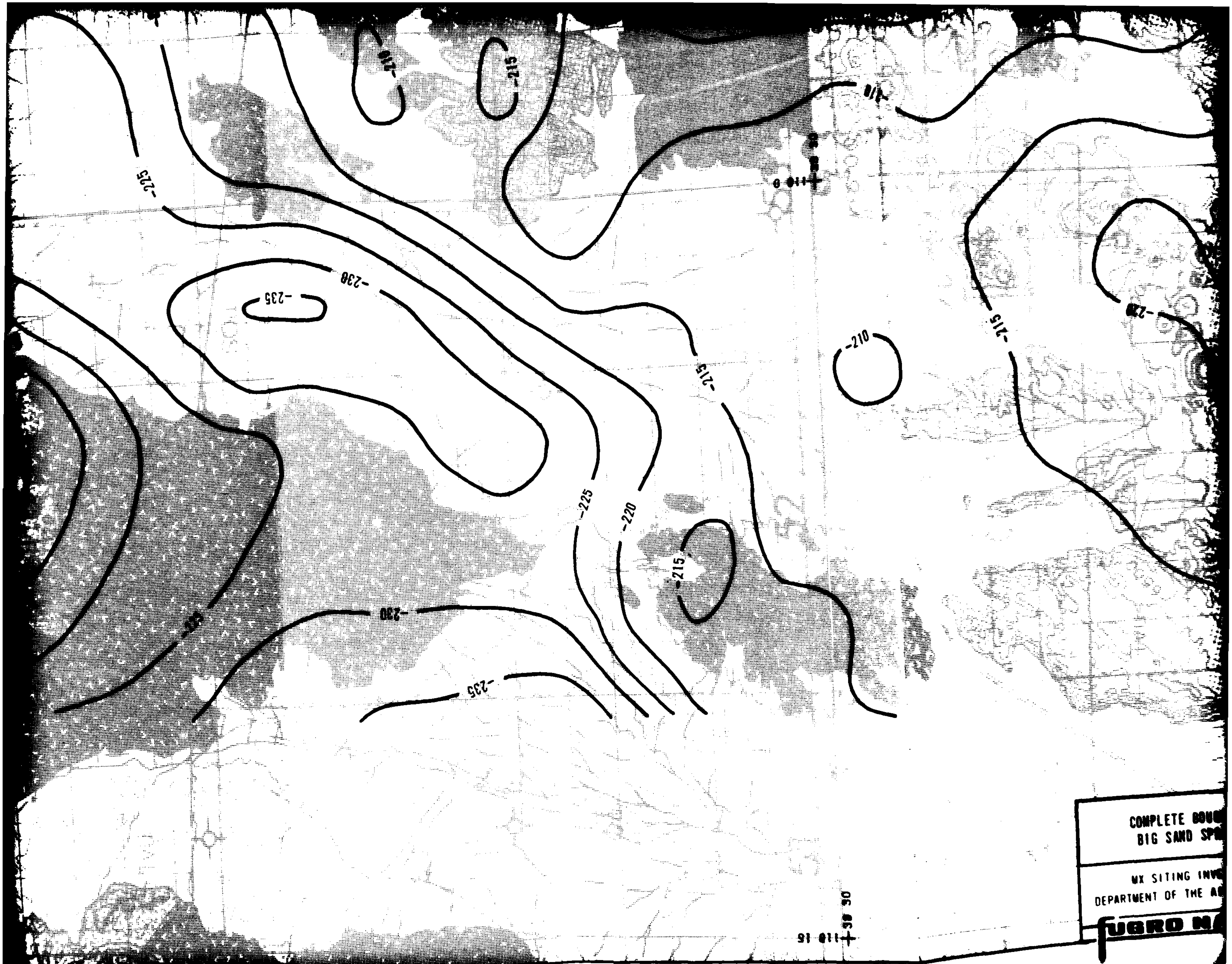

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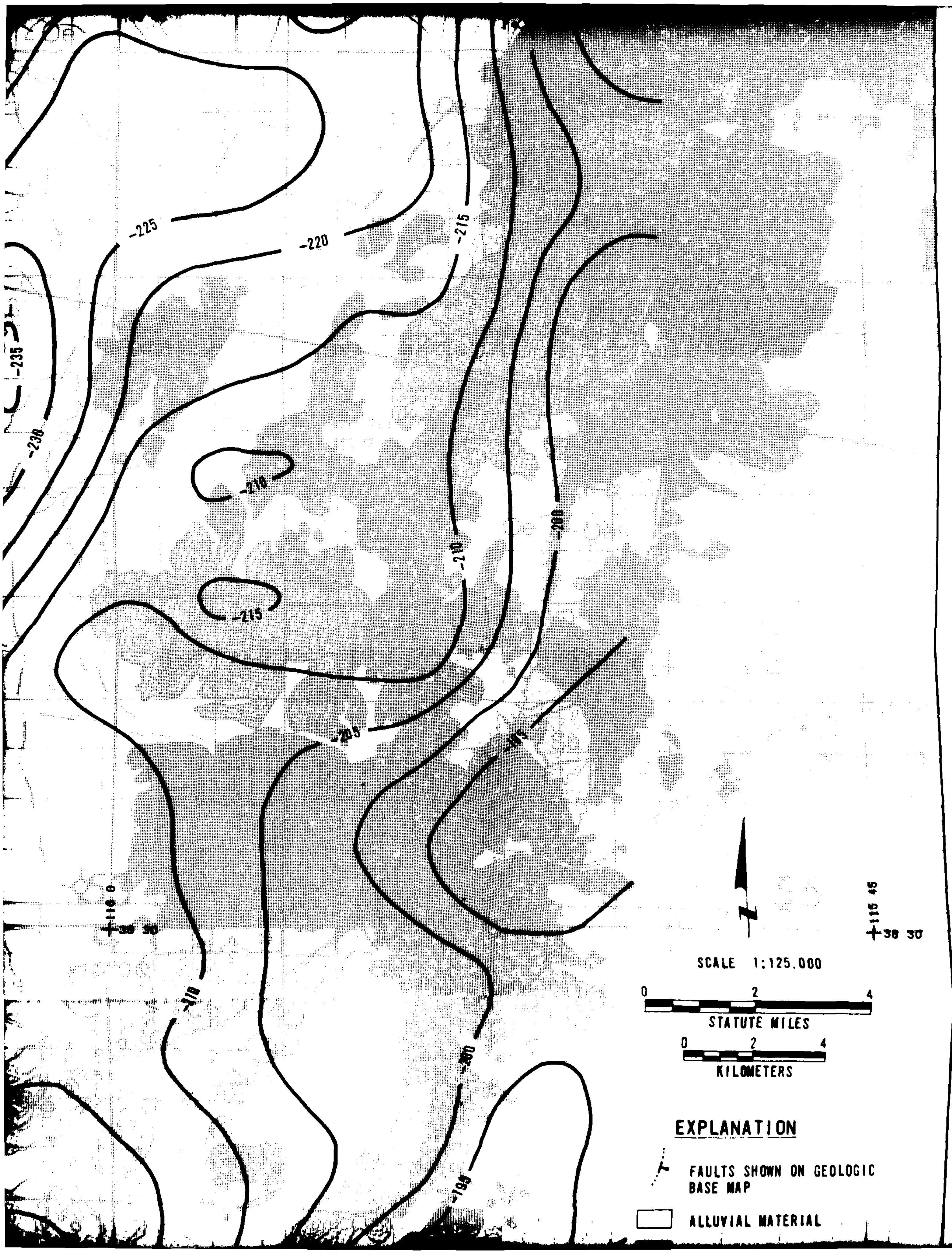
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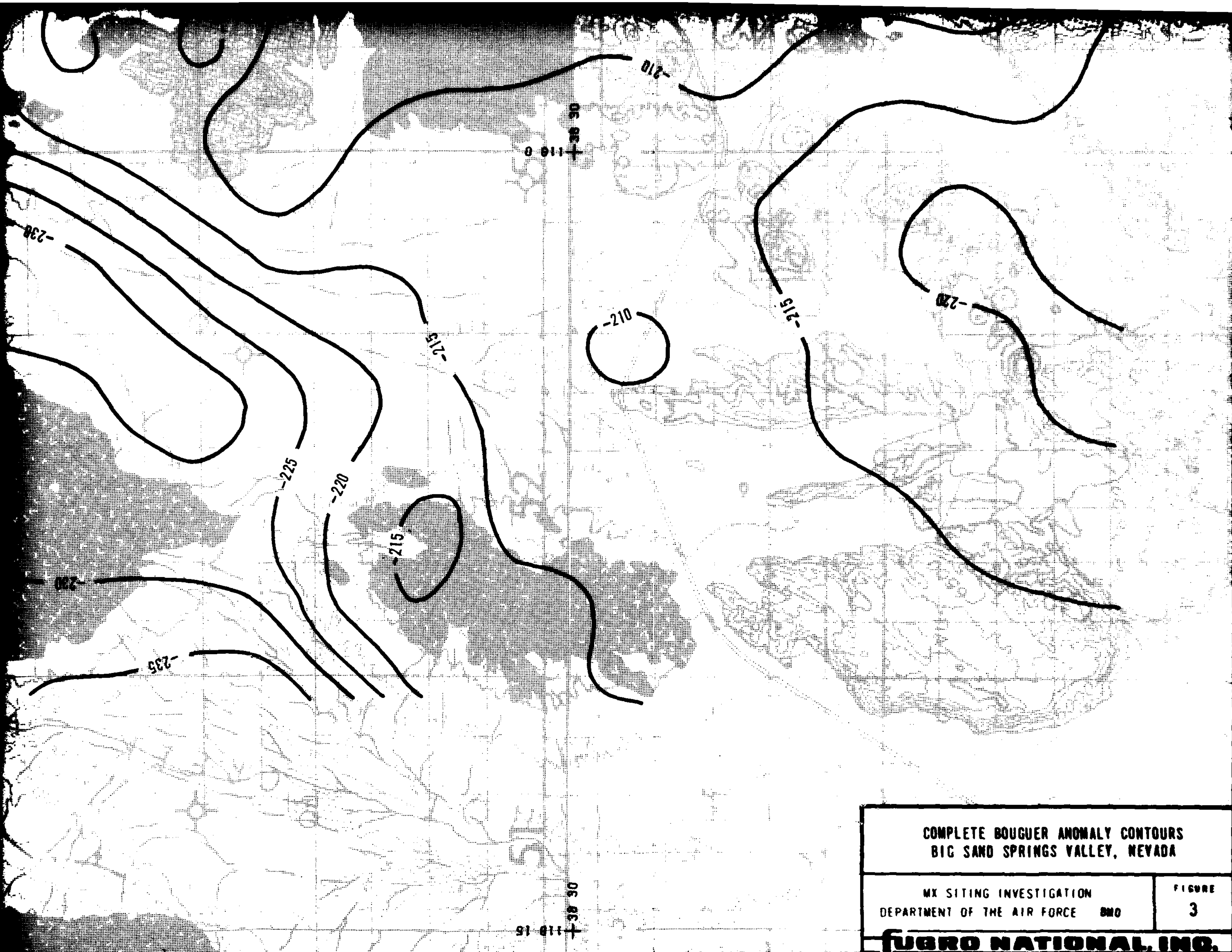

COMPLETE BOUGUER ANOMALY CONTOURS
BIG SAND SPRINGS VALLEY, NEVADA

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FIGURE 3

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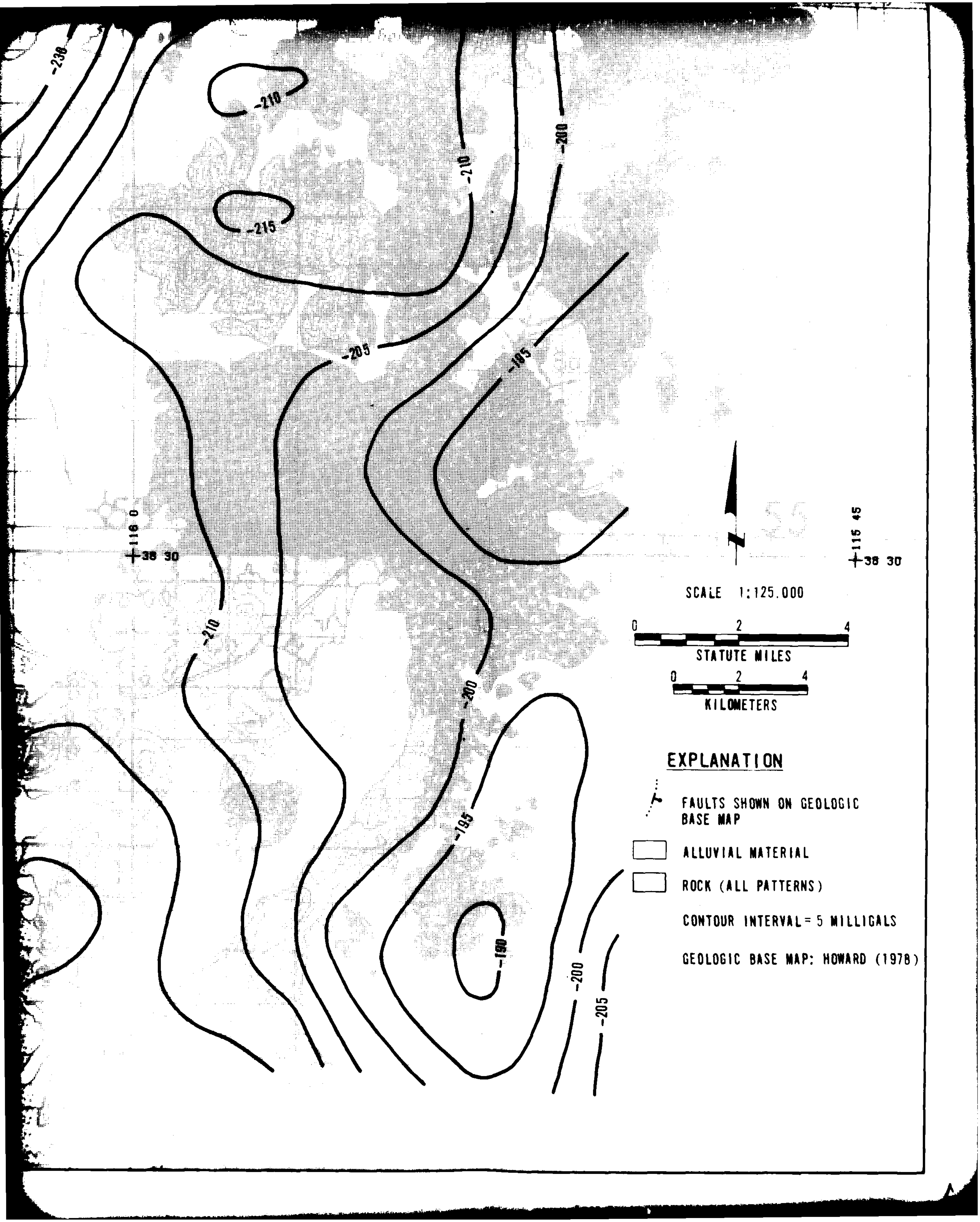
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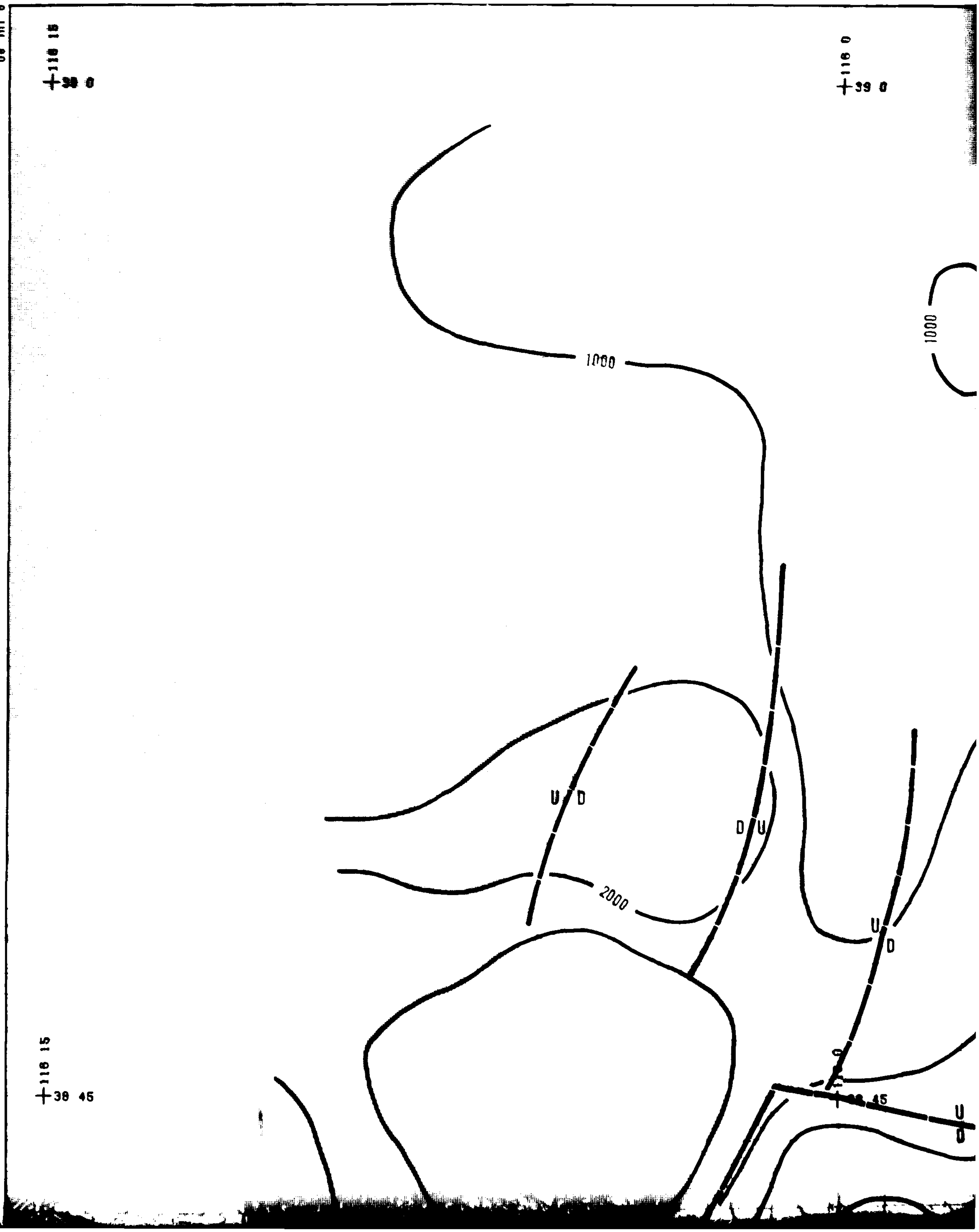
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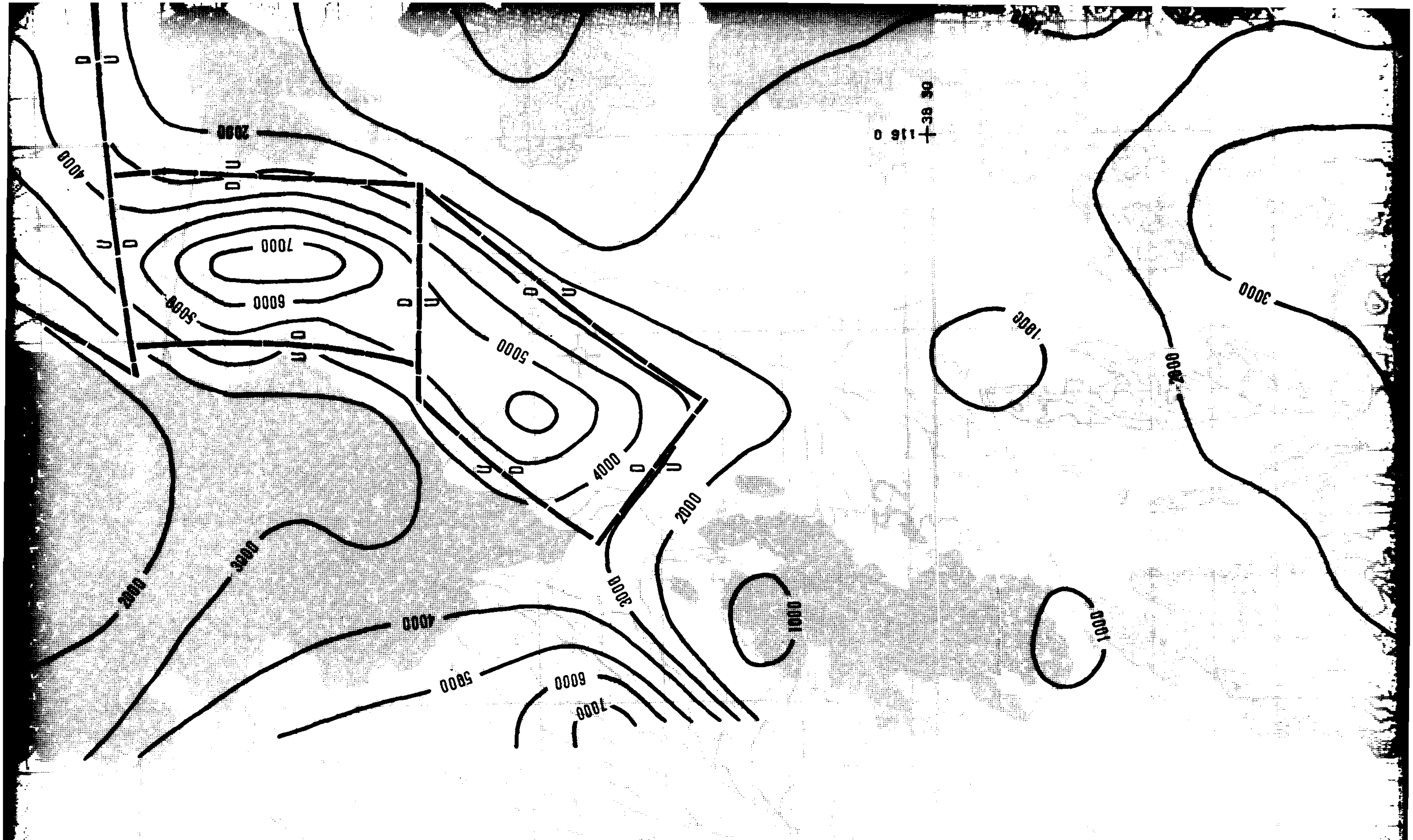

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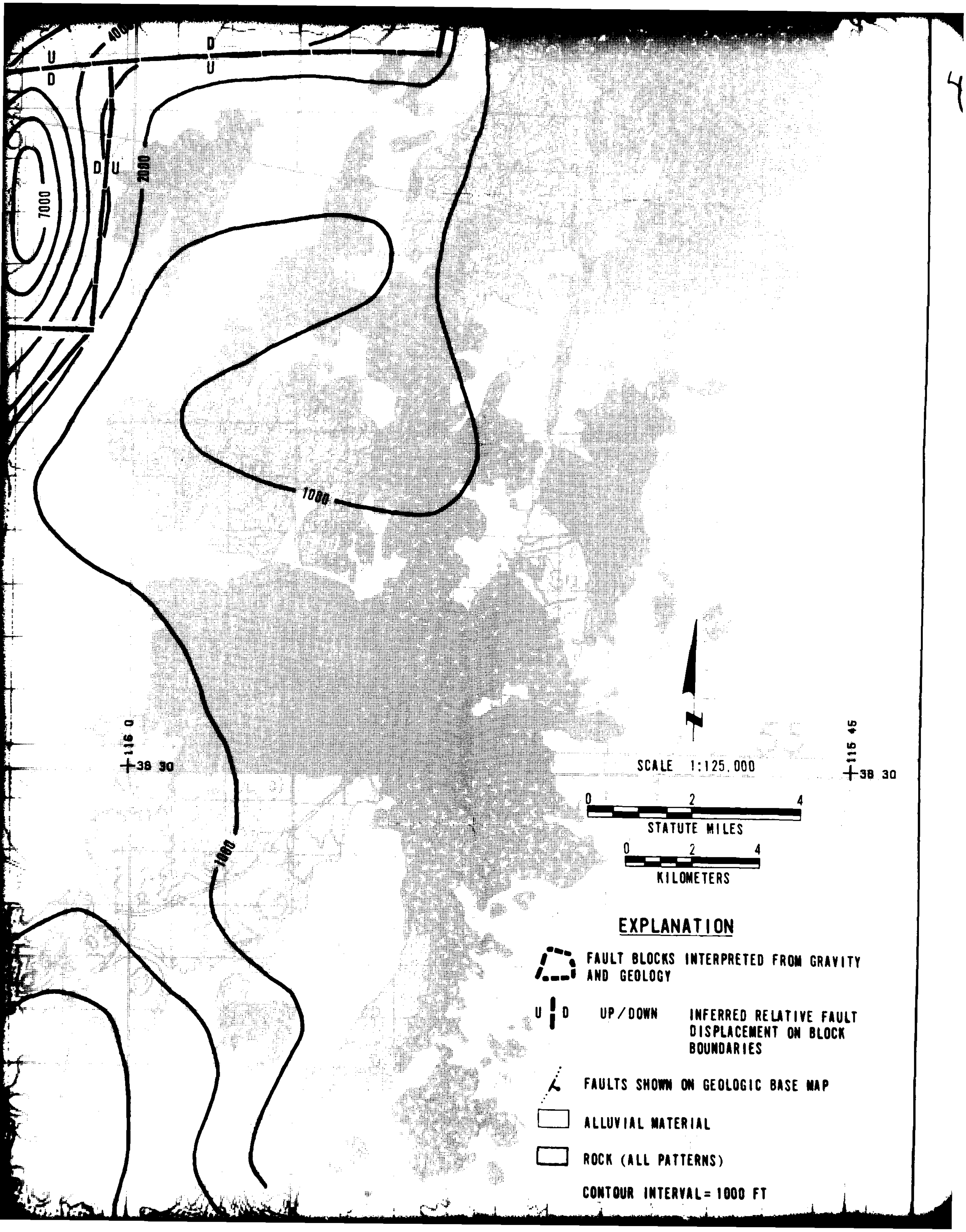
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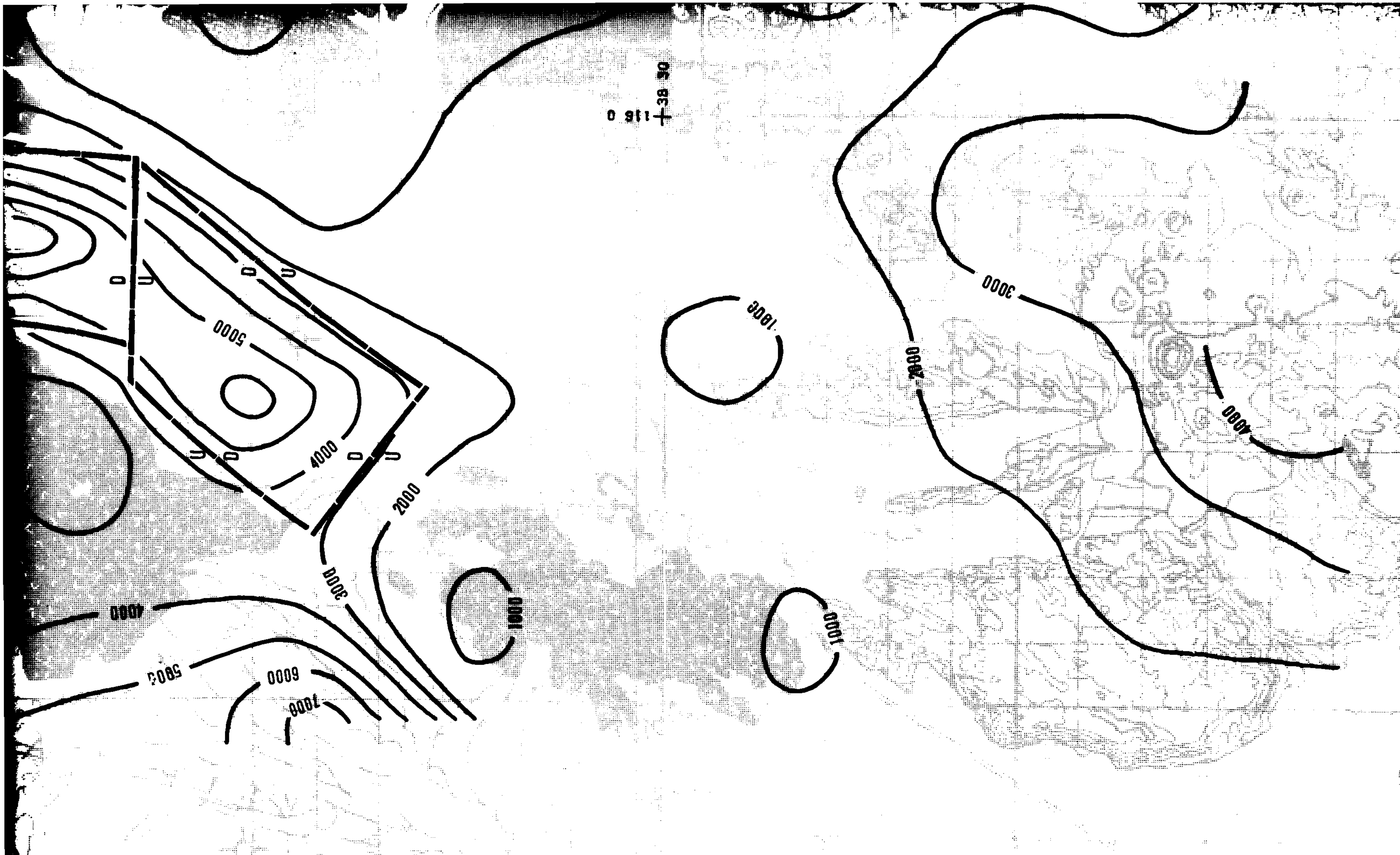

DEPTH TO ROCK
INTERPRETED FROM GRAVITY DATA
BIG SAND SPRINGS VALLEY, NEVADA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMO	FIGURE 4

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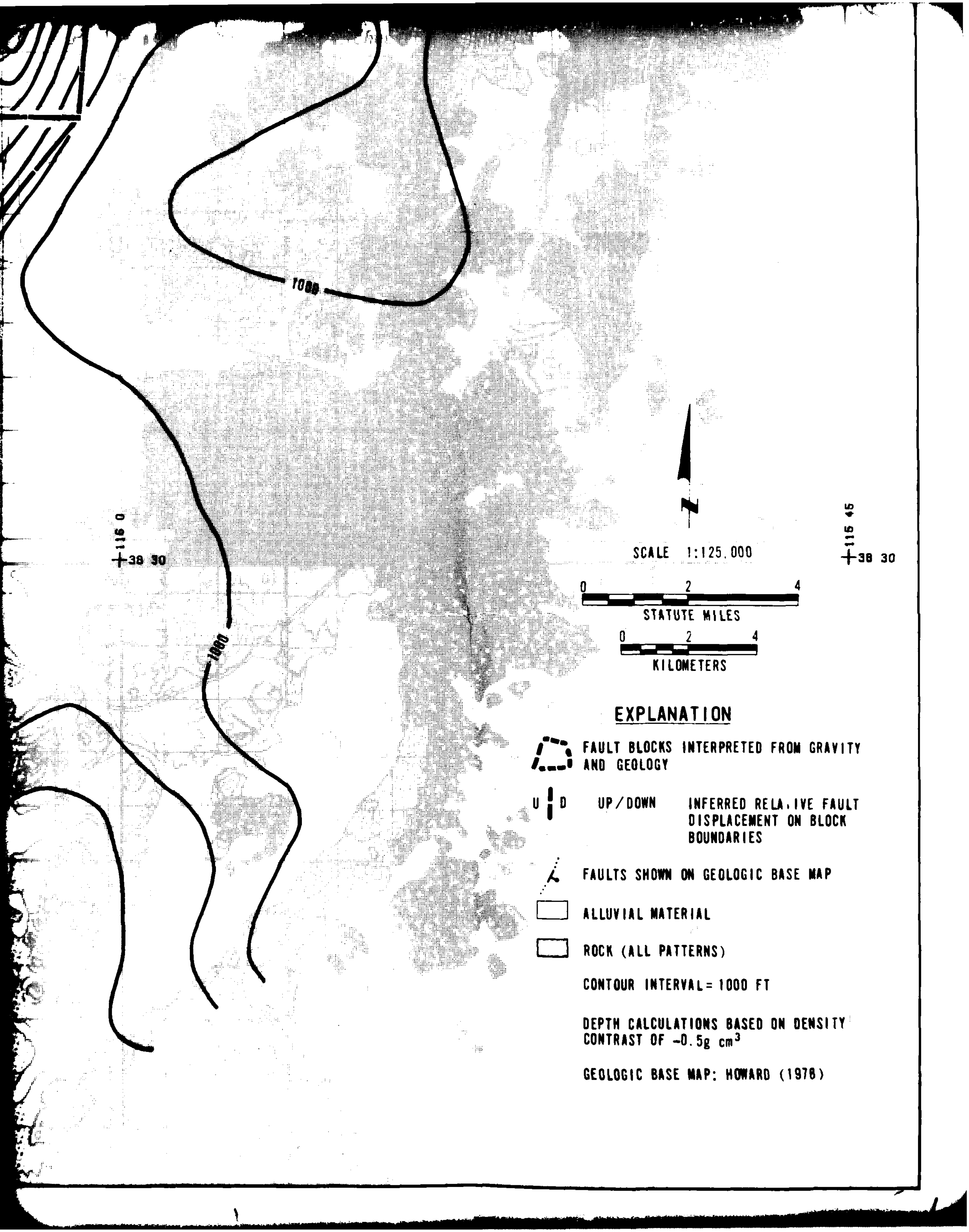
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ROCK (ALL PATTERNS)
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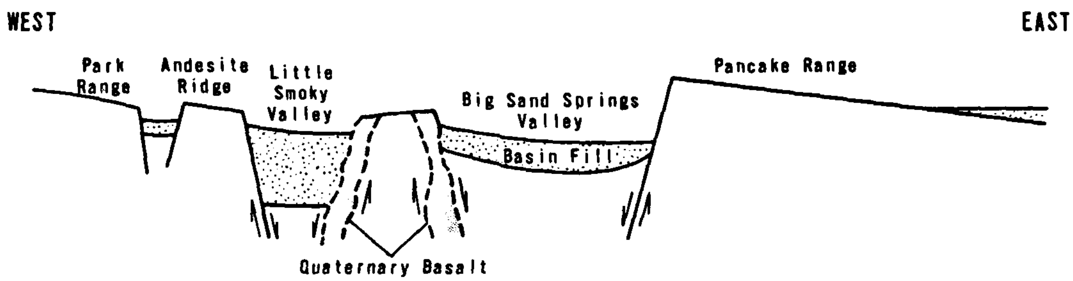
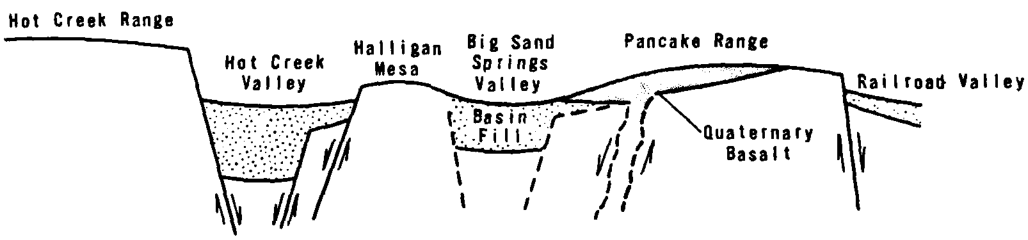
GEOLOGIC BASE MAP: HOWARD (1978)





SIMPLIFIED CONCEPTUAL MODEL OF THE BIG SAND SPRINGS VALLEY REGION, NEVADA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMO	FIGURE 5

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APPENDIX A1.0

GENERAL PRINCIPLES OF THE GRAVITY EXPLORATION METHOD

A1.0 GENERAL PRINCIPLES OF THE GRAVITY EXPLORATION METHOD

A1.1 GENERAL

A gravity survey involves measurement of differences in the gravitational field between various points on the earth's surface. The gravitational field values being measured are the same as those influencing all objects on the surface of the earth. They are generally associated with the force which causes a 1 gm mass to be accelerated at 980 cm/sec^2. This force is normally referred to as a 1 g force.

Even though in many applications the gravitational field at the earth's surface is assumed to be constant, small but distinguishable differences in gravity occur from point to point. In a gravity survey, the variations are measured in terms of milligals. A milligal is equal to 0.001 $cm/second^2$ or 0.00000102 g. The differences in gravity are caused by geometrical effects, such as differences in elevation and latitude, and by lateral variations in density within the earth. The lateral density variations are a result of changes in geologic conditions. For measurements at the surface of the earth, the largest factor influencing the pull of gravity is the density of all materials between the center of the earth and the point of measurement.

To detect changes produced by differing geological conditions, it is necessary to detect differences in the gravitational field as small as a few milligals. To recognize changes due to

geological conditions, the measuremer are "corrected" to account for changes due to differences in elevation and latitude.

Given this background, the basic concept of the gravitational exploration method, the anomaly, can be introduced. If, instead of being an oblate spheroid characterized by complex density variations, the earth were made up of concentric, homogeneous shells, the gravitational field would be the same at all points on the surface of the earth. The complexities in the earth's shape and material distribution are the reason that the pull of gravity is not the same from place to place. A difference in gravity between two points which is not caused by the effects of known geometrical differences, such as in elevation, latitude, and surrounding terrain, is referred to as an "anomaly."

An anomaly reflects lateral differences in material densities. The gravitational attraction is smaller at a place underlain by relatively low density material than it is at a place underlain by a relatively high density material. The term "negative gravity anomaly" describes a situation in which the pull of gravity within a prescribed area is small compared to the area surrounding it. Low-density alluvial deposits in basins such as those in the Nevada-Utah region produce negative gravity anomalies in relation to the gravity values in the surrounding mountains which are formed by more dense rocks.

The objective of gravity exploration is to deduce the variations in geologic conditions that produce the gravity anomalies identified during a gravity survey.

A1.2 INSTRUMENTS

The sensing element of a LaCoste and Romberg gravimeter is a mass suspended by a zero-length spring. Deflections of the mass from a null position are proportional to changes in gravitational attraction. These instruments are sealed and compensated for atmospheric pressure changes. They are maintained at a constant temperature by an internal heater element and thermostat. The absolute value of gravity is not measured directly by a gravimeter. It measures relative values of gravity between one point and the next. Gravitational differences as small as 0.01 milligal can be measured.

A1.3 FIELD PROCEDURES

The gravimeter readings were calibrated in terms of absolute gravity by taking readings twice daily at nearby USGS gravity base stations. Gravimeter readings fluctuate because of small time-related deviations due to the effect of earth tides and instrument drift. Field readings were corrected to account for these deviations. The magnitude of the tidal correction was calculated using an equation suggested by Goguel (1954):

$$C = P + N\cos\phi\,(\cos\phi + \sin\phi) + S\cos\phi\,(\cos\phi - \sin\phi)$$

where C is the tidal correction factor, P, N, and S are time-related variables, and ϕ is the latitude of the observation point. Tables giving the values of P, N, and S are published annually by the European Association of Exploration Geophysicists.

The meter drift correction was based on readings taken at a designated base station at the start and end of each day. Any difference between these two readings after they were corrected for tidal effects was considered to have been the result of instrumental drift. It was assumed that this drift occurred at a uniform rate between the two readings. Corrections for drift were typically only a few hundredths of a milligal. Readings corrected for tidal effects and instrumental drift represented the observed gravity at each station. The observed gravity values represent the total gravitational pull of the entire earth at the measurement stations.

A1.4 DATA REDUCTION

Several corrections or reductions are made to the observed gravity to isolate the portion of the gravitational pull which is due to the crustal and near-surface materials. The gravity remaining after these reductions is called the "Bouguer Anomaly." Bouguer Anomaly values are the basis for geologic interpretation. To obtain the Bouguer Anomaly, the observed gravity is adjusted to the value it would have had if it had been measured at the geoid, a theoretically defined surface which approximates the surface of mean sea level. The difference between the "adjusted" observed gravity and the gravity at the geoid calculated for a theoretically homogeneous earth is the Bouguer Anomaly.

Four separate reductions, to account for four geometrical effects, are made to the observed gravity at each station to arrive at its Bouguer Anomaly value.

a. Free-Air Effect: Gravitational attraction varies inversely as the square of the distance from the center of the earth. Thus corrections must be applied for elevation. Observed gravity levels are corrected for elevation using the normal vertical gradient of:

$$FA = -0.09406 \text{ mg/ft } (-0.3086 \text{ milligals/meter})$$

where FA is the free-air effect (the rate of change of gravity with distance from the center of the earth). The free-air correction is positive in sign since the correction is opposite the effect.

b. Bouguer Effect: Like the free-air effect, the Bouguer effect is a function of the elevation of the station, but it considers the influence of a slab of earth materials between the observation point on the surface of the earth and the corresponding point on the geoid (sea level). Normal practice, which is to assume that the density of the slab is 2.67 grams per cubic centimeter was followed in these studies. The Bouguer correction (B_c), which is opposite in sign to the free-air correction, was defined according to the following formula.

$$B_c = 0.01276\ (2.67)\ h_f \text{ (milligals per foot)}$$

$$B_c = 0.04185\ (2.67)\ h_m \text{ (milligals per meter)}$$

where h_f is the height above sea level in feet and h_m is the height in meters.

c. Latitude Effect: Points at different latitudes will have different "gravities" for two reasons. The earth (and the geoid) is spheroidal, or flattened at the poles. Since points at higher latitudes are closer to the center of the earth than points near the equator, the gravity at the higher latitudes is larger. As the earth spins, the centrifugal acceleration causes a slight decrease in gravity. At the higher latitudes where the earth's radii are smaller, the centrifugal acceleration diminishes. The gravity formula for the Geodetic Reference System, 1967, gives the theoretical value of gravity at the geoid as a function of latitude. It is:

$$g = 978.0381\ (1 + 0.0053204 \sin^2 \phi - 0.0000058 \sin^2 2\phi)\ \text{gals}$$

where g is the theoretical acceleration of gravity and ϕ is the latitude in degrees. The positive term accounts for the spheroidal shape of the earth. The negative term adjusts for the centrifugal acceleration.

The previous two corrections (free air and Bouguer) have adjusted the observed gravity to the value it would have had at the geoid (sea level). The theoretical value at the geoid for the latitude of the station is then subtracted from the adjusted observed gravity. The remainder is called the Simple Bouguer Anomaly (SBA). Most of this gravity represents the effect of material beneath the station, but part of it may be due to irregularities in terrain (upper part of the Bouguer slab) away from the station.

d. Terrain Effect: Topographic relief around the station has a negative effect on the gravitational force at the station. A nearby hill has upward gravitational pull and a nearby valley contributes less downward attraction than a nearby material would have. Therefore, the corrections are always positive. Corrections are made to the SBA when the terrain effects were 0.1 milligal or larger. Terrain corrected Bouguer values are called the Complete Bouguer Anomaly (CBA). When the CBA is obtained, the reduction of gravity at individual measurement points (stations) is complete.

A1.5 INTERPRETATION

The first step in interpretation is to separate the portion of the CBA that might be caused by the light-weight, basin-fill material overlying the heavier bedrock material which forms the surrounding mountains and presumably the basin floor. Since the valley-fill sediments are absent at the stations read in the mountains, the CBA values at these bedrock stations are used as the basis for constructing a regional field over the valley. A regional field is an estimation of the values the CBA would have had if the light-weight sediments (the anomaly) had not been there.

The difference between the CBA and the regional field is called the "residual" field or residual anomaly. The residual field is the interpreter's estimation of the gravitational effect of the geologic anomaly. The zero value of the residual anomaly is not exactly at the rock outcrop line but at some

distance on the "rock" side of the contact. The reason for this is found in the explanation of the terrain effect. There is a component of gravitational attraction from material which is not directly beneath a point.

If the "regional" is well chosen, the magnitude of the residual anomaly is a function of the thickness of the anomalous (fill) material and the density contrast. The density contrast is the difference in density between the alluvial and bedrock material. If this contrast were known, an accurate calculation of the thickness could be made. In most cases, the densities are not well known and they also vary within the study area. In these cases, it is necessary to use typical densities for materials similar to those in the study area.

If the selected average density contrast is smaller than the actual density contrast, the computed depth to bedrock will be greater than the actual depth and vice-versa. The computed depth is inversely proportional to the density contrast. A ten percent error in density contrast produces a ten percent error in computed depth. An iterative computer program is used to calculate a subsurface model which will yield a gravitational field to match (approximately) the residual gravity anomaly.

DAT

FILM